

Extended Abstract

Mineralogical Composition Assessment of Soils from Covurlui and Braila Plains by ATR-FTIR Technique [†]

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[†] Presented at the 15th International Symposium “Priorities of Chemistry for a Sustainable Development” PRIOCHEM, Bucharest, Romania, 30th October–1st November 2019.

Published: 15 October 2019

Keywords: mineralogy; soil; clay minerals; ATR-FTIR

The main purpose of this study is to determine the composition of the mineralogical and organic fraction of the soils from the High Plain of Covurlui and in the Plain of Braila — two relief units located in the south of Moldavia, East Romania. The present study focused on identifying the main clay and non-clay minerals with an important role in the absorption and migration of nutrients (micro- and macro-elements) on the physiologically useful depth of the soil, but also on the content of organic matter, determining the interdependence of these in the development of the cation exchange processes at the pedosphere level [1].

The samples were taken from different locations within the two mentioned relief units, from the first 30 cm of the soil. The materials used consisted of topographic maps and a portable GPS for the location of sampling points, spatulas and labeled plastic bags, and a register of field data recording. Prior to their analysis, the samples were subjected to a preparation phase which consisted of the removal of tin bodies and vegetable debris, fine grinding in porcelain mortar, homogenization and storage in plastic vials. The samples were analyzed by the Total Attenuated Reflectance–Fourier Transform Infrared Spectrometry (ATR-FTIR) technique, using a Bruker Tensor 27 FTIR spectrometer coupled with a diamond ATR device [2]. At the same time, the samples were subjected to a physical–chemical analysis to quantify the proportions of the granulometric fractions and the concentration of organic matter. Soil spectra were recorded in absorbance mode, in the 4000–400 cm^{−1} range. Soil granulometry was determined by the gravimetric method (STAS 7184/10-79), calcite by the volumetric method (SR EN ISO 10693/2014), and organic matter content by the volumetric method (STAS 7184/21-82).

ATR-FTIR analysis showed that the soils contain minerals from the clay group (montmorillonite and kaolinite) but also non-clay minerals (quartz and calcite), which were identified by the absorption bands specific to the vibrations of the chemical groups characteristic of these minerals. The proportion of the granulometric fractions shows that the analyzed soils are predominantly sandy.

Regarding the presence of organic matter in the soil, the obtained spectra highlight a reduced content, underlined by the low intensities of the characteristic peaks, which is well correlated with the quantitative analytical results of this component of the soil.

The ATR-FTIR method is a widely used technique to research the mineralogical structure of the soil. Based on the resulting spectra, we obtained relevant data regarding the presence of some types of minerals involved, in different proportions, in the regime of chemical elements in the soil and

qualitative information about the presence of organic matter. The data were very well correlated with the quantitative chemical results.

References

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